CLAIMS

1. In a computer network comprising a plurality of intermediate nodes, a method for gracefully shutting down a resource contained in an intermediate node, the method comprising the steps of:

   advertising to other intermediate nodes in the network that a resource is being gracefully shut down;

   determining if a condition that warrants shutting down the resource is met; and

   if the condition is met, shutting down the resource.

2. A method as defined in claim 1 wherein the resource is a protocol.

3. A method as defined in claim 1 wherein the resource is an interface.

4. A method as defined in claim 1 wherein the resource is a node.

5. A method as defined in claim 1 comprising the steps of:

   entering one or more commands into the intermediate node to indicate the resource is being gracefully shutdown; and

   advertising the resource is being gracefully shut down.

6. A method as defined in claim 1 comprising the steps of:

   monitoring the resource to determine if the resource should be gracefully shut down; and

   if so, advertising the resource is being gracefully shut down.

7. A method as defined in claim 1 wherein the intermediate node is coupled to one or more neighboring intermediate nodes in the plurality of intermediate nodes.

8. A method as defined in claim 7 comprising the steps of:

2   generating an advertisement message containing an overload bit that is asserted;

3   and

4   flooding the advertisement message to the neighboring intermediate nodes.

1   9.   A method as defined in claim 7 comprising the steps of:

2   generating an advertisement message containing an age value set to a maximum

3   age; and

4   flooding the advertisement message to the neighboring intermediate nodes.

1   10.   A method as defined in claim 7 comprising the steps of:

2   generating an advertisement message that associates the resource with a maxi-

3   mum cost; and

4   flooding the advertisement message to the neighboring intermediate nodes.

1   11.   A method as defined in claim 7 comprising the steps of:

2   generating an advertisement message containing costs associated with non-stub

3   links set to LSInfinity and costs associated with stub links set to an interface output cost;

4   and

5   flooding the advertisement message to the neighboring intermediate nodes.

1   12.   A method as defined in claim 7 comprising the steps of:

2   advertising the resource to the neighboring intermediate nodes;

3   generating an advertisement message that omits the resource; and

4   flooding the advertisement message to the neighboring intermediate nodes.

1   13.   A method as defined in claim 7 comprising the steps of:

2   generating an advertisement message containing a graceful shutdown type-length-

3   value field; and

4   flooding the advertisement message to the neighboring intermediate nodes.

1   14.   A method as defined in claim 13 wherein the advertisement message contains in-

2   formation that identifies the resource being gracefully shut down.

1   15.   A method as defined in claim 1 wherein the condition is an expiration of a prede-

2   termined period of time.

1   16.   A method as defined in claim 1 wherein the condition is the resource reaching a

2   predetermined level of activity.

1   17.   An intermediate node contained in a data network comprising a plurality of inter-

2   mediate nodes, the intermediate node comprising:

3   a resource; and

4   a processor configured to:

5   a) advertise to other intermediate nodes in the network that the resource is being

6   gracefully shut down,

7   b) determine if a condition that warrants shutting down the resource is met and

8   c) if the condition is met, shutting down the resource.

1   18.   An intermediate node as defined in claim 17 wherein the resource is a protocol.

1   19.   An intermediate node as defined in claim 17 wherein the resource is an interface.

1   20.   An intermediate node as defined in claim 17 wherein the resource is a node.

1   21.   An intermediate node as defined in claim 17 wherein the processor is configured

2   to monitor the resource to determine if the resource warrants being gracefully shut down

3   and if so, advertise the resource is being gracefully shut down.

1 22. An intermediate node as defined in claim 17 wherein the processor is configured

2 to advertise the resource is being gracefully shut down in response to one or more com-

3 mands entered into the intermediate node.

1 23. An intermediate node as defined in claim 17 wherein the intermediate node is

2 coupled to one or more neighboring intermediate nodes contained in the plurality of in-

3 termediate nodes.

1 24. An intermediate node as defined in claim 23 wherein the processor is configured

2 to generate an advertisement message containing an overload bit that is asserted and

3 flood the advertisement message to the neighboring intermediate nodes.

1 25. An intermediate node as defined in claim 23 wherein the processor is configured

2 to generate an advertisement message containing an age value set to a maximum age and

3 flood the advertisement message to the neighboring intermediate nodes.

1 26. An intermediate node as defined in claim 23 wherein the processor is configured

2 to generate an advertisement message that associates the resource with a maximum cost

3 and flood the advertisement message to the neighboring intermediate nodes.

1 27. An intermediate node as defined in claim 23 wherein the processor is configured

2 to generate an advertisement message containing costs associated with non-stub links set

3 to LSInfinity and costs associated with stub links set to interface output cost and flood the

4 advertisement message to the neighboring intermediate nodes.

1 28. An intermediate node as defined in claim 23 wherein the processor is configured

2 to generate an advertisement message that omits the resource that is being gracefully shut

3 down and flood the advertisement message to the neighboring intermediate nodes.

1   29.   An intermediate node as defined in claim 23 wherein the processor is configured

2   to generate an advertisement message containing a graceful shutdown type-length-value

3   field and flood the advertisement message to the neighboring intermediate nodes.

1   30.   An intermediate node as defined in claim 29 wherein the advertisement message

2   contains resource information that identifies the resource being gracefully shut down.

1   31.   An intermediate node contained in a data network comprising a plurality of inter-

2   mediate nodes, the intermediate node comprising:

3   a resource;

4   means for advertising the resource is being gracefully shut down to other interme-

5   diate nodes in the network;

6   means for determining if a condition warranting the graceful shutdown of the re-

7   source is met; and

8   means for shutting down the resource if the condition is met.

1   32.   A computer readable medium comprising computer executable instructions for

2   execution in a processor for:

3   advertising a resource contained in an intermediate node is being gracefully shut

4   down to other intermediate nodes in a network;

5   determining if a condition that warrants shutting down the resource is met; and

6   if the condition is met, shutting down the resource.

1   33.   A computer readable medium as defined in claim 32 wherein the condition is the

2   expiration of a predetermined period of time.

1   34.   A computer readable medium as defined in claim 32 wherein the condition is the

2   resource reaching a predetermined level of activity.

1   35.   In a computer network comprising a plurality of intermediate nodes, a method for

2   gracefully shutting down a resource contained in an intermediate node wherein the re-

3   source is associated with one or more connections, the method comprising the steps of:

4   notifying a head-end node of each connection associated with the resource that the

5   resource is being gracefully shut down;

6   determining if a condition associated with the graceful shutdown of the resource

7   is met; and

8   if the condition is met, shutting down the resource.

1   36.   A method as defined in claim 35 comprising the steps of:

2   for each connection:

3   a) establishing an alternative connection;

4   b) switching traffic from the connection to the alternative connection; and

5   c) tearing down the connection.

1   37.   A method as defined in claim 35 wherein the condition is the expiration of a pre-

2   determined period of time.

1   38.   A method as defined claim 35 wherein the condition is the resource reaching a

2   predetermined level of activity.

1   39.   A method as defined claim 35 wherein the condition is a head-end node associ-

2   ated with a connection signaling that the connection is being torn down.

1   40.   In a computer network comprising a plurality of intermediate nodes, a method for

2   gracefully shutting down a resource contained in an intermediate node wherein the re-

3   source is associated with one or more connections and one or more connectionless proto-

4   cols, the method comprising the steps of:

5   gracefully shutting down the one or more connections;

6   determining if a first condition associated with shutting down the connections is

7   met;

8   gracefully shutting down the one or more connectionless protocols;

9   determining if a second condition associated with the shutting down the connec-

10 tionless protocols is met;

11   determining if a condition associated with the graceful shutdown of the resource

12 is met; and

13   if the condition is met, shutting down the resource.

1   41.   A method claim 40 wherein the first condition is the expiration of a predeter-

2   mined period of time.

1   42.   A method claim 40 wherein the first condition is the resource reaching a prede-

2   termined level of activity.

1   43.   A method claim 40 wherein the second condition is an expiration of a predeter-

2   mined period of time.

1   44.   A method claim 40 wherein the second condition is the resource reaching a pre-

2   determined level of activity.

1   45.   A method claim 40 wherein the second condition is a signal from a head-end node

2   associated with a connection, that is associated with a connectionless protocol being shut

3   down, indicating that the connection is being torn down.